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Structural Studies of Organic Crystals of Pharmaceutical Relevance

Correlation of crystal structure analysis with recognised non-
bonded structural motifs in the organic solid state

By

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of Doctor of Philosophy**

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ABSTRACT

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Structural Studies of Organic Crystals of Pharmaceutical Relevance

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Pharmaceutical solids tend to exist in different physical forms termed as polymorphs. Issues about pharmaceutical systems are mainly concerned with the active ingredient's physico-chemical stability and bioavailability.

The main aim of this study is to investigate the non-bonded interactions in pharmaceutical solids that govern the physical pharmaceuticals performance of such materials and through the use of structural techniques and correlation of these results with crystal structural database to establish the presence of physical motifs in selected systems. Structural motifs were identified by the use of single crystal and crystal packing analysis on diverse range of pharma-relevant materials including chalcones, cryptolepines, biguanides and xanthines. These selected systems were validated using functional group and molecular analysis and correlating them to the Cambridge Structural Database. Crystallization studies are done on these selected systems as well as exploiting those using synthetic analogues.

A total of 51 crystal structures were investigated including 16 new structure determinations. Addition synthesis of new xanthines to investigate novel intermolecular patterns was also undertaken. The understanding and exploitation of intermolecular interactions involving hydrogen bonds and coordination complexation during packing can be used in the design and synthesis of solid state molecular structures with desired physical and chemical properties.

TABLE OF CONTENTS

ABSTRACT	i
ACKNOWLEDGEMENTS	xix
DEDICATION	xx
1.0 INTRODUCTION.....	1
1.1 Aim and Objectives	2
1.2 Justification of study.....	3
1.3 The Crystalline State.....	7
1.3.1 Crystal lattice	9
1.4 Non-Bonded interactions	12
1.4.1 Dipole-Dipole interactions.....	12
1.4.2 Dispersion forces	12
1.4.3 <i>Pi</i> Stacking (π -Stacking).....	13
1.5 Hydrogen Bonds.....	14
1.6 Structure-Activity Relationships of Selected Systems	18
1.7 Structure Motifs	20
1.7.1 Hydrogen Bonding Interactions.....	20
1.7.2 Carbon and Hydrogen atom non-bonded interactions	23
1.7.3Halogen-halogen Interactions	31
1.7.4 Stack and Herringbone Patterns of Aromatic Molecules	33
1.8 Analytical Methods for Analysis of Solid State	34
1.8.1 Vibrational Spectroscopy	35
1.8.1.1 Infra-red spectroscopy	37
1.8.1.1 Raman spectroscopy	38
1.8.2 X-ray Diffraction	39

1.8.2.1 Patterson Methods	44
1.8.2.2 Direct Methods	44
1.8.2.3 Powder X-ray Diffraction (PXRD)	46
1.8.2.4 Databases	47
2.0 EXPERIMENTAL	50
2.1 Materials	50
2.2 Physical Methods	51
2.2.1 Infra-red Spectra Data Collection (IR)	51
2.2.1.1 Preparation of KBr Disc	51
2.2.2 Raman Spectroscopy Data Collection (RS).....	51
2.2.3 Nuclear Magnetic Resonance Spectroscopy (NMR)	52
2.2.4 Mass Spectrometry (MS).....	52
2.2.5 Powder X-Ray Data Collection (PXRD).....	53
2.3 Synthetic Studies	53
2.3.1 Powdered Co-Crystals	53
2.3.2 Synthesis of Xanthines	54
2.3.2.1 Preparation of 1-Monosubstituted Xanthines	56
2.4 Single Crystal Studies.....	64
2.4.1 (E)-1- (3,4-Dichloro-phenyl)-3-p-tolyl- propenone (Compound (C I)).....	64
2.4.1.1 Data Collection for compound (C I)	64
2.4.1.2 Structure Solution and Refinement for compound (C I)	64
2.4.2 (E)-3-(3-Ethoxy-4-methoxy-phenyl)-1-(3,4,5,-trimethoxy-phenyl)- propenone (compound (C II)).....	66
2.4.2.1 Data Collection for compound (C II)	66
2.4.2.2 Structure Solution and Refinement for compound (C II)	66

2.4.3 1-(3, 5-Dimethoxy-cyclohexyl)-3-(4-methoxy-cyclohexyl)-propan-1-one (Compound (C III))	68
2.4.3.1 Data Collection for compound (C II)	68
2.4.3.2 Structure Solution and Refinement for compound (C III)	68
2.4.4 SS_2Br_OOm (2-Bromo-5-methyl-10H-indolo (3,2 b)quinoline) (Compound (C IV))	69
2.4.4.1 Data Collection for compound (C IV)	69
2.4.4.2 Structure Solution and Refinement for compound (C IV)	69
2.4.5SS_2F_NO ₂ _Om (Compound (C V))	70
2.4.5.1 Data Collection for compound (C V)	70
2.4.5.2 Structure Solution and Refinement for compound (C V)	71
2.4.6 SS_2Cl_NO ₂ _Om (Compound (C VI))	72
2.4.6.1 Data Collection for compound (C VI)	72
2.4.6.2 Structure Solution and Refinement for compound (C VI)	72
2.4.7 2-Chlorocryptocl_Om (2-Chlorohexadecahydro-indolo (3,2-b)quinoline) (Compound (C VII))	73
2.4.7.1 Data Collection for compound (C VII)	73
2.4.7.2 Structure Solution and Refinement for compound (C VII)	73
2.4.8 IS_Chemstep_Om (3-diaminomethyl-1,1-dimethyl-urea) Compound (C VIII))	74
2.4.8.1 Data Collection for compound (C VIII)	74
2.4.8.2 Structure Solution and Refinement for compound (C VIII)	75
2.4.9 1,3-Dimethyl-6-methylene-1,3,6,7-tetrahydro-purin-2-one (EE II_TPCF_ac_Om) (Compound (C IX))	76
2.4.9.1 Data Collection for compound (C IX)	76
2.4.9.2 Structure Solution and Refinement for compound (C IX)	76

3.0 CHALCONES	78
3.1 Description of Selected Crystals.....	83
3.1.1 (E)-1- (3,4-Dichloro-phenyl)-3-p-tolyl-propenone (C I)	83
3.1.2. (E)-3-(3-Ethoxy-4-methoxy-phenyl)-1-(3,4,5,-trimethoxy-phenyl)- propenone (PP1038) (C II)	93
3.1.3 1-(3, 5-dimethoxy-cyclohexyl)-3-(4-methoxy-cyclohexyl)- Propan-1-one (pp120 (test)) (C III)	103
4.0 CRYPTOLEPINES	116
4.1 Description of Selected Crystals.....	119
4.1.1 SS_2Br_OOm (2-Bromo-5-methyl-10H-indolo (3,2 b)quinoline) C IV	119
4.1.2 SS_2F_NO ₂ _Om (Compound (C V)).....	126
4.1.3 SS_2Cl_NO ₂ _Om (C VI)	135
4.1.42-Chlorocryptphcl_Om(2-Chlorohexadecahydro-indolo (3,2 b) quinoline) (C VII).....	142
4.2.5 Description of aromatic dispositions	148
5.0 BIGUANIDES.....	154
5.1 Description of Packing Motifs.....	158
5.1.1 Closely related structures of BI.....	158
5.1.2 Closely related structures of BII	168
5.1.3 Closely related structures of BIII.....	177
6.0 XANTHINES.....	194
6.1 Description of Packing Motifs.....	199
6.1.1 Closely related structures of D I	199
6.1.2 Closely related structures of DII.....	207
6.1.3 Closely related structures of DIII	209
6.2 Infra-red spectra.....	233

6.3 Raman spectra.....	236
7.0 CONCLUSION AND RECOMMENDATIONS	238
7.1 Conclusions.....	238
7.2 Recommendations for future work.....	240
REFERENCES	241
APPENDIX A.....	262
APPENDIX B.....	271
APPENDIX C.....	288
APPENDIX D.....	291
APPENDIX E.....	304
APPENDIX F.....	312
APPENDIX G.....	320
APPENDIX H.....	323

TABLE OF FIGURES

Figure 1.1	A Unit cell showing angles (α, β, γ) and side lengths (a, b, c).....	8
Figure 1.2	Diagram of hydrogen Bonds	14
Figure 1.3	Diagram showing the geometry of a hydrogen bond.	14
Figure 1.4	Diagram showing Hydrogen Bonded Zero Network (Closed Loop)	16
Figure 1.5	Diagram indicating One Dimensional Hydrogen Bonded	16
Figure 1.6	Diagram illustrating two dimensional hydrogen bonded network	17
Figure 1.7	showing intra and intermolecular hydrogen bonding in urea derivative..	21
Figure 1.8	Diagram showing hydrogen bonding (C-F....H and N-O....H) in 9-nitro-7-(trifluoromethyl)dodecahydropyrido[1,2- <i>a</i>]benzimidazole.....	22
Figure 1.9	Diagram showing hydrogen bonding (C-H....O) during packing in Chalcones viewed along the b-axis.....	24
Figure 1.10	Diagram showing intra and intermolecular hydrogen bonding in Xanthines (Theophylline)	26
Figure 1.11	Diagram of hydrogen bonding in a chalcone	29
Figure 1.12	Preferred Geometrical Parameters Essential for Cl.....Cl Interaction	31
Figure 1.13	Halogen-Halogen bonding in 1,4-dichlorobenzene	32
Figure 1.14	Diagram showing Stack Packing (left) and Herringbone Packing (right).	33
Figure 1.15	Vibrational Energy Levels.....	35
Figure 1.16	Schematic diagrams showing wave interferences during diffraction...	39
Figure 1.17	Diagram Showing <i>Reflection</i> of X-Rays through points in a Lattice by Imaginary Planes	40
Figure 1.18	Diagram Showing <i>Reflection</i> of X-Rays through points in a Lattice by Imaginary Planes	41
Figure 1.19	A Schematic Flow Chart Illustrating the successive steps involved in Crystal Structure Determination	45

Figure 2.1 Diagram of Xanthine showing the numbering scheme adopted.....	54
Figure 2.2 Diagram showing the typical synthetic procedure of C. Müller and Sandoval-Ramirez.....	55
Figure 3.1 The Structure of Chalcones showing the numbering scheme dopted.....	78
Figure 3.2 The Structure of Hydroxylated Chalcone.....	78
Figure 3.3 Diagram showing both the E and Z forms of Chalcones	80
Figure 3.4 Studied Chalcones	82
Figure 3.5 Chalones with simple crystal structures determined with Cambridge Structural Database (CSD) refcodes	82
Figure 3.6 The X-ray Structure of C I showing the numbering scheme adopted	83
Figure 3.7 The packing diagram of C I viewed down the <i>a</i> -axis	86
Figure 3.8 A view down the <i>b</i> -axis showing the alternating stacking of chains in the crystal.....	86
Figure 3.9 Crystal packing diagram of C I viewed down the <i>a</i> -axis	87
Figure 3.10 A unit cell of C I showing long-range pseudo-herringbone aromatic interactions between molecules viewed down the <i>c</i> -axis	87
Figure 3.11 A schematic view of the chlorine-chlorine interaction involved during stacking of C I.....	88
Figure 3.12 Schematic representation of the geometry of the Cl.....Cl intermolecular interaction in C I.....	88
Figure 3.13 The packing diagram of KERCUG's structure viewed down the <i>a</i> -axis.....	89
Figure 3.14 A unit cell of KERCUG's structure showing aromatic interactions between molecules viewed down the <i>a,b</i> -axis.....	89
Figure 3.15 The X-ray Structure of C II showing the numbering scheme adopted.....	93
Figure 3.16 The crystal packing diagram of C II viewed down the <i>a</i> -axis	95
Figure 3.17 A view down the <i>a</i> -axis showing stacking of chains in the crystal.....	96
Figure 3.18 A unit cell of Compound C II showing aromatic stacking interactions between molecules viewed down the <i>b</i> -axis.....	97

Figure 3.19 A view of the intermolecular interaction involved during stacking of C II.....	98
Figure 3.20 Schematic representation of the geometry of the C-H.....O,	99
Figure 3.21 The crystal packing diagram of CICSEN structure viewed down the <i>a</i> -axis.....	100
Figure 3.22 A diagram of CICSEN structure showing aromatic packing interactions between molecules viewed down the <i>a</i> -axis	100
Figure 3.23 The X-ray structure of C III	103
Figure 3.24 The packing diagram of C III viewed down the <i>b</i> -axis.....	105
Figure 3.25 A view down the <i>b</i> -axis showing the alternating stacking of chains in the crystal.....	106
Figure 3.26 Crystal packing diagram of C III showing herringbone arrangement viewed down the <i>b</i> -axis	106
Figure 3.27 A unit cell of Compound C III showing herringbone aromatic interactions between molecules viewed down the <i>a</i> -axis	107
Figure 3.28 A view of the hydrogen bonding interaction involved during packing of C III.....	108
Figure 3.29 Schematic representation of the geometry of the C-H.....O intermolecular interaction in compound III.....	108
Figure 3.30 The crystal packing diagram of CICMEH structure viewed down the <i>a</i> -axis.....	109
Figure 3.31 A diagram of CICMEH structure showing aromatic packing interactions between molecules viewed down the <i>c</i> -axis	109
Figure 4.1 The Structure of Cryptolepines	117
Figure 4.2 The X-ray structure of Compound IV	119
Figure 4.3 The packing diagram of C IV viewed down the <i>c</i> -axis.....	121
Figure 4.4 The packing diagram of C IV viewed along the <i>b</i> -axis.....	121
Figure 4.5 A view down the <i>c</i> -axis showing the alternating stacking of chains in the crystal.....	122
Figure 4.6 A unit cell of Compound C IV showing non-bonded intermolecular aromatic interactions between molecules viewed down the <i>c</i> -axis	122

Figure 4.7 A schematic view of the hydrogen bonding involved during stacking of compound C IV.....	123
Figure 4.8 The X-ray structure of C V	126
Figure 4.9 The packing diagram of C V viewed down the <i>c</i> -axis	128
Figure 4.10 The packing diagram of C V viewed along the <i>c</i> -axis	129
Figure 4.11 A view down the <i>c</i> -axis showing the alternating stacking of chains in the crystal.....	129
Figure 4.12 A unit cell of Compound C V showing non-bonded intermolecular aromatic interactions between molecules viewed down the <i>c</i> -axis	130
Figure 4.13 A schematic view of the bonded and non-bonded interactions involved during stacking of C V.....	131
Figure 4.14 The X-ray structure of C VI.....	135
Figure 4.15 The packing diagram of Compound C VI viewed down the <i>c</i> -axis	137
Figure 4.16 A view down the <i>c</i> -axis showing the alternating stacking of chains in the crystal.....	138
Figure 4.17 A unit cell of C VI showing non-bonded intermolecular aromatic interactions between molecules viewed down the <i>c</i> -axis	138
Figure 4.18 A schematic view of the hydrogen bonding involved during stacking of C VI.....	139
Figure 4.19 The X-ray structure of C VII.....	142
Figure 4.20 The packing diagram of C VII viewed down the <i>c</i> -axis	144
Figure 4.21 A view down the <i>b</i> -axis showing the alternating stacking of chains in the crystal.....	144
Figure 4.22 A unit cell of Compound C VII showing non-bonded intermolecular aromatic interactions between molecules viewed down the <i>b</i> -axis	145
Figure 4.23 A schematic view of the hydrogen bonding involved during stacking of compound C VII.....	145
Figure 4.24 Diagram showing parameters used to illustrate aromatic dispositions .	148
Figure 4.25 Structure of the salt form of cryptolepines showing the numbering system adopted.....	150

Figure 5.1 The Molecular structure of Metformin.....	156
Figure 5.2 Schematic diagram of Primary molecular unit.....	156
Figure 5.3 Matrix of Structural Variants of the Primary Molecular Unit Studied ..	156
Figure 5.4 Simple crystal structures of B I determined with Cambridge Structural Database (CSD) refcodes.....	157
Figure 5.5 Diagram of C VIII [IS_Chemstep_Om (3-diaminomethyl-1,1-dimethyl-urea)] Structure	158
Figure 5.6 The X-ray structure of C VIII	158
Figure 5.7 Interactions during stacking of Compound C VIII viewed down the <i>b</i> -axis	160
Figure 5.8 A view down the <i>a</i> -axis of Compound C VIII showing crystal packing of compound VIII	160
Figure 5.9 A unit cell of Compound C VIII showing intermolecular aromatic interactions between molecules viewed down the <i>c</i> -axis	161
Figure 5.10 A schematic view of the hydrogen bonding interaction involved during stacking of C VIII	161
Figure 5.11 Diagram of JAMRIY Structure	164
Figure 5.12 A view down the <i>ac</i> -axis showing intermolecular hydrogen bond interactions in JAMRIY structure.....	164
Figure 5.13 The packing diagram of JAMRIY structure viewed along the <i>c</i> -axis...	165
Figure 5.14 Diagram of PAJBUIY Structure.....	166
Figure 5.15 A view down the <i>ab</i> -axis showing intermolecular hydrogen bond interactions in PAJBUIY structure	166
Figure 5.16 The packing diagram of PAJBUIY structure viewed along the <i>b</i> -axis ..	167
Figure 5.17 Diagram of B II	168
Figure 5.18 Simple crystal structures of B II determined with Cambridge Structural Database (CSD) refcodes.....	169
Figure 5.19 Diagram of BGDUSM10 Structure.....	169
Figure 5.20 A view down the <i>ab</i> -axis showing intermolecular hydrogen bond interactions in BGDUSM10 structure	170

Figure 5.21 The packing diagram of BGDUSM10 structure viewed along the <i>a</i> -axis	170
Figure 5.22 Diagram of BGUHCL Structure	171
Figure 5.23 A view down the <i>a</i> -axis showing intermolecular hydrogen bond interactions in BGUHCL structure	171
Figure 5.24 The packing diagram of BGUHCL structure viewed along the <i>a</i> -axis.....	172
Figure 5.25 Diagram of BIGUAN Structure	172
Figure 5.26 A view down the <i>b</i> -axis showing intermolecular hydrogen bond interactions in BIGUAN structure	173
Figure 5.27 The packing diagram of BIGUAN structure viewed along the <i>b</i> -axis..	173
Figure 5.28 Diagram of RAWBAS Structure.....	174
Figure 5.29 A view down the <i>a</i> -axis showing intermolecular hydrogen bond interactions in RAWBAS structure	174
Figure 5.30 The packing diagram of RAWBAS structure viewed along the <i>b</i> -axis	175
Figure 5.31 Diagram of RAWBEW01 Structure.....	176
Figure 5.32 A view down the <i>ab</i> -axis showing intermolecular hydrogen bond interactions in RAWBEW01 structure	176
Figure 5.33 The packing diagram of RAWBEW01 structure viewed along the <i>cb</i> -axis.....	176
Figure 5.34 Diagram of B III.....	177
Figure 5.35 Simple crystal structures of B III determined with Cambridge Structural Database (CSD) refcodes	178
Figure 5.36 DAWDAH Structure	179
Figure 5.37 A view down the <i>b</i> -axis showing intermolecular hydrogen bond interactions in DAWDAH	179
Figure 5.38 A schematic view of the hydrogen bonding involved during packing of DAWDAH structure	179
Figure 5.39 Diagram of DUNHID Structure	180
Figure 5.40 A view down the <i>b</i> -axis showing intermolecular hydrogen bond interactions in DUNHID.....	181

Figure 5.41 The packing diagram of DUNHID structure viewed along the <i>c</i> -axis...	181
Figure 5.42 Diagram of GADQAE Structure	182
Figure 5.43 A view down the <i>b</i> -axis showing intermolecular hydrogen bond interactions in GADQAE structure.....	182
Figure 5.44 The packing diagram of GADQAE structure viewed along the <i>b</i> -axis.	182
Figure 5.45 Diagram of EKIBAB Structure	184
Figure 5.46 A view down the <i>c</i> -axis showing intermolecular hydrogen bond interactions in EKIBAB structure.....	184
Figure 5.47 The packing diagram of EKIBAB structure viewed along the <i>b</i> -axis...	184
Figure 5.48 Diagram of KAGLUA Structure	185
Figure 5.49 A view down the <i>a</i> -axis showing intermolecular hydrogen bond interactions in KAGLUA structure.....	186
Figure 5.50 The packing diagram of KAGLUA structure viewed along the <i>c</i> -axis.	186
Figure 5.51 Diagram of TAKZOV Structure	187
Figure 5.52 A view down the <i>c</i> -axis showing intermolecular hydrogen bond interactions in TAKZOV structure	188
Figure 5.53 The packing diagram of TAKZOV structure viewed along the <i>a</i> -axis.	188
Figure 5.54 Diagram of MECSOD Structure	189
Figure 5.55 A view down the <i>ac</i> -axis showing intermolecular hydrogen bond interactions in MECSOD structure	190
Figure 5.56 The packing diagram of MECSOD structure viewed along the <i>a</i> -axis.....	190
Figure 5.57 Diagram of JODZOR Structure.....	191
Figure 5.58 A view down the <i>c</i> -axis showing intermolecular hydrogen bond interactions in JODZOR structure	191
Figure 5.59 The packing diagram of JODZOR structure viewed along the <i>a</i> -axis.....	192
Figure 6.1 Diagram of Caffeine, Theobromine and Theophylline	195
Figure 6.2 The Molecular structure of Xanthine	195

Figure 6.3 Schematic diagram of Primary molecular unit.....	197
Figure 6.4 Matrix of Structural Variants of the Primary Molecular Unit Studied.....	197
Figure 6.5 Simple crystal structures of D I determined with Cambridge Structural Database (CSD) refcodes.....	198
Figure 6.6 Diagram of D I	199
Figure 6.7 Diagram of DHTHYM Structure	199
Figure 6.8 A view down the <i>a</i> -axis showing intermolecular hydrogen bond interactions in DHTHYM structure	199
Figure 6.9 The packing diagram of DHTHYM structure viewed along the <i>a</i> -axis.....	200
Figure 6.10 Diagram of DHURAC10 Structure	200
Figure 6.11 A view down the <i>b</i> -axis showing intermolecular hydrogen bond interactions in DHURAC10 structure.....	201
Figure 6.12 The packing diagram of DHURAC10 structure viewed along the <i>a</i> -axis.....	201
Figure 6.13 Diagram of NAURCL Structure	202
Figure 6.14 A view down the <i>a</i> -axis showing intermolecular hydrogen bond interactions in NAURCL structure	202
Figure 6.15 The packing diagram of NAURCL structure viewed along the <i>a</i> -axis.....	202
Figure 6.16 Diagram of URACIL Structure	203
Figure 6.17 A view down the <i>a</i> -axis showing intermolecular hydrogen bond interactions in URACIL structure.....	203
Figure 6.18 The packing diagram of URACIL structure viewed along the <i>a</i> -axis....	203
Figure 6.19 Diagram of XIGMEG Structure	204
Figure 6.20 A view down the <i>a</i> -axis showing intermolecular hydrogen bond interactions in XIGMEG structure.....	204
Figure 6.21 The packing diagram of XIGMEG structure viewed along the <i>a</i> -axis ..	205
Figure 6.22 Diagram of WUDVAS Structure	205

Figure 6.23 A view down the <i>a</i> -axis showing intermolecular hydrogen bond interactions in WUDVAS structure	206
Figure 6.24 The packing diagram of WUDVAS structure viewed along the <i>ab</i> -axis.....	206
Figure 6.25 Diagram of D II	207
Figure 6.26 Simple crystal structure of D II determined with Cambridge Structural Database (CSD) refcodes	207
Figure 6.27 Diagram of VANCOD	208
Figure 6.28 A view down the <i>b</i> -axis showing intermolecular hydrogen bond interactions in VANCOD structure	208
Figure 6.29 The packing diagram of VANCOD structure viewed along the <i>c</i> -axis.....	208
Figure 6.30 Diagram of D III.....	209
Figure 6.31 Simple crystal structures of D III determined with Cambridge Structural Database (CSD) refcodes	210
Figure 6.32 Diagram of C IX [1,3-Dimethyl-6-methylene-1,3,6,7-tetrahydro-purin-2-one] Structure	211
Figure 6.33 The X-ray structure of C IX	211
Figure 6.34 The packing diagram of C IX viewed down the <i>b</i> -axis.....	212
Figure 6.35 Crystal packing diagram of C IX viewed down the <i>c</i> -axis	212
Figure 6.36 C IX showing aromatic intermolecular interactions between molecules viewed down the <i>a</i> -axis during packing	213
Figure 6.37 Diagram of JULXUJ Structure.....	218
Figure 6.38 A view down the <i>b</i> -axis showing intermolecular hydrogen bond interactions in JULXUJ structure	218.
Figure 6.39 The packing diagram of JULXUJ structure viewed along the <i>b</i> -axis ..	218
Figure 6.40 Diagram of ETEPDO Structure.....	219
Figure 6.41 A view down the <i>b</i> -axis showing intermolecular hydrogen bond interactions in ETEPDO structure	219
Figure 6.42 The packing diagram of ETEPDO structure viewed along the <i>b</i> -axis ..	220
Figure 6.43 Diagram of CAFFCD Structure	220

Figure 6.44 A view down the <i>b</i> -axis showing intermolecular hydrogen bond interactions in CAFFCD structure	221
Figure 6.45 The packing diagram of CAFFCD structure viewed along the <i>c</i> -axis ..	222
Figure 6.46 Diagram of CAFINE Structure	222
Figure 6.47 A view down the <i>c</i> -axis showing intermolecular hydrogen bond interactions in CAFINE structure	222
Figure 6.48 The packing diagram of CAFINE structure viewed along the <i>c</i> -axis ..	222
Figure 6.49 Diagram of FADCUI Structure	223
Figure 6.50 A view down the <i>a</i> -axis showing intermolecular hydrogen bond interactions in FADCUI structure	223
Figure 6.51 The packing diagram of FADCUI structure viewed along the <i>c</i> -axis ..	223
Figure 6.52 Diagram of GAZYIP Structure	224
Figure 6.53 A view down the <i>c</i> -axis showing intermolecular hydrogen bond interactions in GAZYIP structure	224
Figure 6.54 The packing diagram of GAZYIP structure viewed along the <i>c</i> -axis.....	225
Figure 6.55 Diagram of DEMXUO Structure	225
Figure 6.56 A view down the <i>c</i> -axis showing intermolecular hydrogen bond interactions in DEMXUO structure	226
Figure 6.57 The packing diagram of DEMXUO structure viewed along the <i>c</i> -axis	226
Figure 6.58 Diagram of CEJRAL Structure	227
Figure 6.59 A view down the <i>b</i> -axis showing intermolecular hydrogen bond interactions in CEJRAL structure	227
Figure 6.60 The packing diagram of CEJRAL structure viewed along the <i>b</i> -axis ..	228
Figure 6.61 Diagram of FIDSAN Structure	229
Figure 6.62 A view down the <i>a</i> -axis showing intermolecular hydrogen bond interactions in FIDSAN structure	229
Figure 6.63 The packing diagram of FIDSAN structure viewed along the <i>a</i> -axis ..	229
Figure 6.64 Diagram of GEJQAO Structure	230

Figure 6.65 A view down the <i>a</i> -axis showing intermolecular hydrogen bond interactions in GEJQAO structure	230
Figure 6.66 The packing diagram of GEJQAO structure viewed along the <i>c</i> -axis .	231
Figure 6.67 Diagram of HEKTEW Structure	231
Figure 6.68 A view down the <i>a</i> -axis showing intermolecular hydrogen bond interactions in HEKTEW structure.....	232
Figure 6.69 The packing diagram of HEKTEW structure viewed along the <i>a</i> -axis	232

TABLE OF TABLES

Table 1.1 The Crystal Systems	8
Table 1.2 Table of Energy transitions in each region of the electromagnetic spectrum.....	35
Table 2.1 Chemical used for Analysis.....	50
Table 2.2 Ratios of Powdered Combinations.....	53
Table 3.1 Intermolecular interactions geometry for C II.....	99
Table 3.2 Non-bonded hydrogen interaction geometry for compound III	108
Table 3.3 Selected bond lengths (Å).....	113
Table 3.4 Selected bond Angles (°)	113
Table 4.1 Hydrogen-bonding geometry for C V.....	125
Table 4.2 Hydrogen bonded and non-bonded interaction geometry for C V	132
Table 4.3 Hydrogen interaction geometry for C VI	139
Table 4.4 Hydrogen-bonding geometry for C VII.....	147
Table 4.5 Selected bond lengths (Å).....	150
Table 4.6 Selected bond Angles (°)	151
Table 4.7 Selected Bond lengths (Å).....	153
Table 4.8 Selected Bond Angles (°)	153
Table 5.1 Hydrogen-bonding geometry for C VIII	162
Table 6.1 Hydrogen-bonding geometry for C IX	213
Table 6.2 -6. 3 Table of Selected Bond Lengths	216
Table 6.4 -6.6 Table of Selected Bond Angles	216

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DEDICATION

This thesis is dedicated to my wife *Helen Michelle Korkor Essandoh* for her unlimited prayers, love, support, encouragement and determination.